Harding Lawson Associates

November 22, 1993

HLA Project No. 20875-4.18 Supersedes HLA Document No. 20875359.1

Mr. Patrick S. Steerman
Browning-Ferris Industries, Inc.
Two Eldridge Place
757 North Eldridge
Houston, Texas 77079

Reference: Evaluation of Stabilization To Date and Response to EPA's Request for Additional Information
Pilot Study 4 & Active Area 1
Bailey Site

Dear Pat:

This letter summarizes HLA's evaluation of the stabilization performed to date by CWM at the Bailey site, which has been in the Pilot Study 4 area and Active Area 1 of the East Waste Area. The evaluation is based on our field observations and the laboratory testing that has been performed thus far. It should be noted that the laboratory testing to date has been performed for the pilot studies/demonstrations. This is further addressed later in this letter. This letter also includes our response to EPA's letter of November 2, 1993, where EPA requests that additional information be provided so it can further evaluate the Piranha mixing technique.

EPA's letter requests additional information on five items relating to the stabilization test data; four items relate to Pilot Study 4, and one item to Active Area 1. HLA's response to each of the five requested items is provided in the same order as presented in EPA's letter. For convenience we have included, where possible, the results of our evaluation in the response to EPA's specific request for information.

To better understand the background for the evaluation we performed, the following two paragraphs summarize the basis for the stabilization performance requirements in the Technical Specifications and the applicability of the 1991 laboratory stabilization evaluation to the East Waste Area. The results of our evaluation are summarized in the final sections of this letter under Conclusions.

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20875366.1

Engineering and
Environmental Services

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BASIS FOR PROJECT SPECIFICATIONS

The requirements in the project specifications relating to the waste stabilization are set forth in the Technical Specifications, § 02242, Part 1.04:

- A minimum unconfined compressive (UC) strength of 25 pounds per square inch (psi) at 7 days; and

- A permeability of 1 x 10^{-6} centimeters per second (cm/sec) or less.

The preceding Technical Specifications requirements were derived from the Consent Decree (CD), Record of Decision (ROD), Remedial Investigation (RI), Feasibility Study (FS), EPA documents (listed below), and follow up written correspondence between the BSSC and EPA regarding the criteria to be included in the design.

- Handbook For Stabilization/Solidification of Hazardous Wastes; EPA/540/2-86/001; dated June 1986; and

- Stabilization/Solidification of CERCLA & RCRA Wastes; EPA/625/6-89/022; dated May 1989.

Based on the above documents, HLA has determined that the intent of stabilizing the on-site waste was to produce a stabilized mass having:

- a permeability at least one order of magnitude <u>less</u> than that of the surrounding native soils; the low permeability is to decrease the mobility in the stabilized waste and slow the transfer of any leachable contaminants from the stabilized waste into groundwater; and,

- a minimum unconfined compressive strength capable of supporting the cap to be constructed on top of the stabilized waste.

1991 STABILIZATION EVALUATION

The Stabilization Evaluation Report (SER), which was a CD requirement, presents the results of the bench-scale stabilization evaluation performed in 1991 by HLA as a part of the remedial design. According to the SER, Sample Area 7 (identified on Plate 3 of the SER) was located in the East Waste area where the present Active Areas 1 and 2 are located. This waste was identified as "soft, saturated, black cindery waste with rubbery chunks".

For seven of the nine waste sample areas identified in the SER, including Sample Area 7, cement was found to be the most effective stabilizer, based on the laboratory treatability study. The project specifications (Table 1 in Section 02242, Page 6) show a minimum cement content requirement of 20 percent, by total weight of the waste. It should be noted that the specifications are "performance" based, whereby the Contractor has the flexibility and responsibility to make field modification(s) as necessary, to meet the project requirements (see Technical Specifications 02242 Waste Stabilization, Part 1.04 Performance Criteria, and Part 3.01 Field Demonstration, paragraph A and Table 1).

The SER indicates that the permeability of the on-site waste decreased by approximately one order of magnitude after the addition of the stabilizing agents. A resulting permeability of 1×10^{-6} cm/sec (or less) was achieved during the laboratory treatability study, for the recommended quantities of stabilizing agents shown in Table 1 in Section 02242, Page 6 of the technical specifications.

RESPONSE TO EPA'S COMMENTS

1) Provide the location, depth, and UC strength for each of the four samples collected for UC strength analysis of the "Piranha" stabilization pilot.

The location, depth, and UC strengths for the samples tested for the Piranha pilot study are provided in Tables 1 and 1A (attached). Samples were obtained using a drill rig with a 5-foot continuous core barrel; the samples were sectioned into one and two-foot lengths for handling convenience and to reduce disturbance during transportation. Four undisturbed samples were initially selected for UC testing and six for permeability testing. The remaining samples were not tested because they either showed signs of disturbance or appeared similar to the ones selected for testing.

Since the BSSC's October 29, 1993 letter (referenced in EPA's November 2, 1993 letter), HLA has performed additional testing on five of the remaining samples from the Piranha demonstration area: two for UC strength and three for permeability. The additional tests were performed to obtain more data to evaluate the strength vs permeability relationship. We also performed two specific gravity tests on the stabilized waste samples, one from PS4-1 and one from PS4-2; the intent was to compute and evaluate pertinent physical characteristics of the stabilized waste. The results of these additional tests are also summarized in Table 1.

According to CWM, 27.5 percent cement (by total weight of waste) was mixed into the waste over a 20-foot square area; the cement was mixed with the waste, using Piranha equipment, to an average depth of 6.5 feet below existing grade.

2) ***Discuss any correlation between UC strength and the permeability analysis test results for the two sample locations (PS4-1, PS4-2).***

The UC strength/permeability correlation for PS4-1 and PS4-2 is plotted in Figure 1 (attached). A line of best fit has been drawn to show the approximate relationship. Even though there is scatter in the data, it indicates that the permeability decreases as the UC strength increases. According to this line, the average UC strength corresponding to the target permeability (1×10^{-6} cm/sec) is approximately 80 psi.

Two main variables that influence UC strength are the amount of cement added and the final density of the stabilized mass. We believe that the high cement content is the primary contributor to the high strength corresponding to the target permeability; however, it does not reduce the voids contained in the stabilized waste. Higher voids result in a less dense stabilized mass which can result in higher permeability.

We also evaluated permeability vs dry density, moisture content and void ratio; however, because of considerable scatter in the data, no meaningful relationships could be established. We believe this scatter is more likely indicative of variations in the mixing process than changes in the waste.

3) ***Provide copies of all field notes, photographs, and video taken by the BSSC, HLA and CWM of the "Piranha" stabilization pilot.***

Copies of HLA's field notes for the Piranha stabilization are included as Attachment A. A copy of a video taken by Mr. Pat Steerman with the BSSC showing the Piranha operation is also enclosed. Photographs will be provided separately.

4) ***Discuss any differences between sample locations PS4-1 and PS4-2 (i.e., was there a problem with excessive water at one location and not the other during the "Piranha" stabilization pilot?).***

Sample location PS4-2 was in an area that had ponded water at the time of stabilization and shallow samples (within the top 5 feet) of the stabilized waste from this location had 23 to 43 percent higher moisture contents than corresponding samples from PS4-1. A comparison of the average moisture content after stabilization in PS4-2 with that from the treatability study (SER) in this area indicates an 18 percent higher moisture content at PS4-2.

Dry densities for these sample depths at PS4-2 were 9 pounds per cubic foot (pcf) lower than corresponding sample depths at PS4-1. While the specific gravity for PS4-2 is slightly lower (5%) than that for PS4-1, this only accounts for a difference of 2 pcf in the dry densities between the two sample locations. The remainder of the difference is likely due to the higher moisture content. Additionally, a comparison of the dry density after stabilization in PS4-2 with that from the treatability study (SER) in this area indicates a dry density 13 percent lower at PS4-2. The computed void ratios for the above samples are also generally higher for the samples at PS4-2 than at PS4-1.

We believe that the above differences can be attributed to the excess available water at PS4-2. This could have resulted in the higher computed void ratio, because during stabilization and mixing, more of the sample volume was likely occupied by the water at PS4-2 than at PS4-1. The lower dry density obtained at PS4-2 also tends to corroborate this hypothesis.

When preparing the samples for laboratory testing we noted the following differences. Samples from PS4-2 were less cohesive than samples from PS4-1; upon completion of the permeability tests the PS4-2 samples partially crumbled, while the PS4-1 samples remained intact. Voids were apparent in PS4-2 samples, but not in the PS4-1 samples.

5) In addition, please provide all UC strength and permeability data, not previously provided, collected from samples taken from Active Area 1 where the site waste has been stabilized using the Millgard (MEC-TOOL) system.

Two pilot studies (1 and 2) were previously performed by CWM in Active Area 1, where the inject-and-mix method (MEC-TOOL system) was used for waste stabilization. Results from both pilot studies did not meet all the project specifications for strength, permeability or consistency. Therefore, additional sampling and testing, as described below, was performed in Active Area 1 to further evaluate the MEC-TOOL system. Visual comparison of the waste from Active Area 1 to that described in the SER (Sample Area 7), shows the wastes to be similar.

VIBRACORE SAMPLING

During production stabilization in Active Area 1, the Vibracore technique was used to collect continuous samples from nine locations. Sample locations included the centers of individual shafts (stabilized by the MEC-TOOL system) and overlap areas between adjacent shafts. Sampling was performed at these nine locations the same day that the shafts were stabilized. Twenty-seven samples were tested for UC strength and ten samples were tested for permeability after seven days. The laboratory test results are summarized in Table 2.

The UC strengths ranged from 14 to 222 psi, with an average (mean) value of 67 psi and a median[1] value of 52 psi. Four of the 27 samples tested (15 percent) had strengths lower than 25 psi. The UC strength results indicate that 85 percent of the samples tested met the project requirement of 25 psi. The low strength samples were randomly dispersed throughout the nine sample locations, and therefore no specific cause could be attributed to the low strengths.

The results show significant variation in the strengths attained. A standard deviation of 52 was calculated using the 27 test data. Standard deviation is a measure of how widely the values are dispersed from the average value. The standard deviation of 52 psi is considerably higher than the 25 psi required by the specification. In this case, one standard deviation (52) indicates strength values ranging from 15 (67-52) to 119 (67+52). Because the measured strengths are generally higher than the minimum 25 psi required, they are considered to meet the intent of the project requirement.

The measured permeabilities ranged from 1.5×10^{-6} to 8.5×10^{-5} cm/sec for the nine samples tested, with a median value of 5.8×10^{-6} cm/sec. None of the test results met the permeability requirement of 1×10^{-6} cm/sec or less. The range in the laboratory permeability results is about two orders of magnitude, i.e., a 1×10^{2} cm/sec spread between the high and the low value. The median value indicates one order of magnitude higher permeability than the maximum target permeability requirement of 1×10^{-6} cm/sec.

CONCLUSIONS

From our evaluation we conclude that the project specifications are not consistently being met; measured strength data show a low failure rate, however, permeability data show a high failure rate. As a result, the stabilization that has been completed cannot be considered to have passed the project requirements at this time.

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[1] The median value is the value where one half of the values are greater and one half the values are less than this value.

As noted in the introductory paragraphs of this letter, the sampling and testing available at this time is associated primarily with the pilot studies or demonstrations. Complete "production" QC verification sampling and testing as outlined in the project documents has not been completed. The QC testing to verify stabilization during production follows a systematic approach by obtaining QC samples at the grid intersects after a grid area (approximately 50 ft. x 50 ft.) is completed (see Section 2.3.6 of the project sampling and monitoring plan). The test data collected thus far is randomly located because it is associated with the various pilot studies/demonstrations that have been performed, and because CWM has moved around in stabilizing Active Area 1. For these reasons, complete QC testing coverage has not yet been obtainable, delaying the evaluation and acceptance process. Because the stabilization performed by CWM thus far, at least in part, is not meeting the project requirements, we plan to expedite the remaining QC coring and sampling in that portion of Active Area 1 where stabilization has been performed.

Based on the test results thus far, and our field observations of both the MEC-TOOL and Piranha mixing processes, we believe either method will ultimately be successful at meeting the objectives of the stabilization once the "start-up bugs" are worked out by CWM.

While a permeability vs moisture content relationship was not quantifiable due to the scatter in the data, the test results indicate that the moisture content of the stabilized waste has some effect on the permeability. Insufficient moisture results in excessive bulking and higher voids; excessive moisture results in less bulking, but also higher voids because more of the waste volume is occupied by water. We found that the target permeabilities were achieved for stabilized waste samples having moisture contents between 50 and 65 percent. The density of the stabilized mass can also be seen to play an important role in achieving the strength and permeability requirements. It is important for CWM to understand these relationships between moisture content, density and permeability so that they can control, or modify their field procedures accordingly.

PIRANHA EQUIPMENT - To date, the only permeability test results meeting the specifications were from the Pilot Study 4 area (PS4-1) where the Piranha was used. Our field observations indicate that there is less bulking associated with the Piranha than the MEC-TOOL equipment, which is good. Even though some permeability tests did not pass, we believe this was due to the ponded water in the area which increased the moisture content, coupled with possibly non-uniform mixing associated with the Contractor becoming familiar with this technique.

MEC-TOOL EQUIPMENT - The MEC-TOOL equipment produced better results during production stabilization than it did during Pilot Studies 1 and 2. However, the QC test results obtained during pilot stabilization in Active Area 1 show that while the UC strengths generally meet the specifications, the permeability test results did not. Our field observations of the MEC-TOOL operation indicate excessive bulking of the stabilized waste, upon removal of the injector shaft. In our opinion, this is the most probable cause for the higher permeabilities.

Should you have any questions or comments regarding this evaluation, please do not hesitate to contact us.

Very truly yours,

HARDING LAWSON ASSOCIATES

FOR Albert A. Joseph, P.E.
Associate Engineer

Steven R. Neely, P.E.
Project Manager

Attachments: As stated

cc: Debra Baker

TABLE 1

SUMMARY OF STABILIZATION QC TEST RESULTS FOR PILOT STUDY 4 (PIRANHA EQUIPMENT)

HLA SAMPLE BORING	DEPTH (ft)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	VOID RATIO	UC STRENGTH (psi)	PERMEABILITY (cm/sec)
PS4-1	2.5	52	61	-	115	-
PS4-1	3.0	49	60	1.113	-	2.2 X 10^{-7}
PS4-1	4.5	50	57	-	88	-
PS4-1	5.0	48	60	1.137	-	5.5 X 10^{-8}
PS4-1	5.5	41	43	-	60	-
PS4-1	7.0	52	24	0.984	-	1.5 X 10^{-5}
PS4-1	7.5	51	59	-	104	-
PS4-1	8.0	49	57	1.080	-	1.7 X 10^{-7}
PS4-1	Specific Gravity =1.65					
PS4-2	0.5	40	74	1.443	-	6.2 X 10^{-4}
PS4-2	2.0	48	70	-	37	-
PS4-2	2.5	46	40	1.112	-	1.9 X 10^{-4}
PS4-2	4.0	39	86	1.531	-	2.3 X 10^{-4}
PS4-2	6.0	56	33	-	84	-
PS4-2	7.0	44	46	1.231	-	4.7 X 10^{-4}
PS4-2	8.0	43	65	1.271	-	3.5 X 10^{-7}
PS4-2	Specific Gravity= 1.57					

NOTE: Dry Density, moisture content and void ratio values are values measured in the laboratory at the beginning of each test.

TABLE 1A
SAMPLE LOCATION COORDINATES

HLA SAMPLE BORING	NORTHING COORDINATE	EASTING COORDINATE
PS4-1	8950	9849
PS4-2	8946	9860

TABLE 2
SUMMARY OF STABILIZATION QC TEST RESULTS
FOR ACTIVE AREA 1 (MEC-TOOL EQUIPMENT)

CWM SHAFT NUMBER	DEPTH (ft)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	VOID RATIO	UC STRENGTH (psf)	PERMEABILITY (cm/sec)
54	3.5	53	53	-	14	-
54	4.0	54	37	0.872	-	2.9×10^{-6}
54	7.0	48	37	1.106	-	2.8×10^{-5}
54	8.5	50	54	-	31	-
54	11.5	51	64	-	21	-
55	0.5	70	31	-	83	-
55	3.0	63	39	-	72	-
55	5.0	59	45	-	42	-
55	5.5	58	40	0.729	-	4.4×10^{-6}
55	7.0	73	44	-	41	-
60/62	4.0	72	34	-	143	-
60/62	10.5	53	54	-	52	-
60/62A	4.5	64	43	0.566	-	8.2×10^{-6}
61/62	0.5	77	27	-	196	-
61/62	3.5	68	31	-	222	-
61/62	5.5	56	37		104	-
61/62	11.5	54	35	0.872	-	8.5×10^{-5}
61/62	12.5	53	56	-	22	-
61/62	14.0	54	66	-	38	-
62	1.0	61	41	0.652	-	6.2×10^{-6}
62	2.0	63	36	-	126	-
62	4.0	58	49	-	63	-
78	0.5	76	34	-	56	-
78	2.5	66	47	-	39	-
78	3.0	64	39	0.580	-	6.1×10^{-5}
78	6.0	69	51	-	55	-
78	18.0	70	42	-	72	-
95	4.0	65	46	0.542	59	1.5×10^{-6}
95	14.0	61	51	-	18	-
96	0.0	74	31	-	85	-
96	1.0	76	30	0.322	38	3.5×10^{-6}
96	2.0	62	44	-	46	-
96	3.0	65	39	0.547	-	5.4×10^{-6}
96	4.0	64	50	-	30	-
96	5.5	82	48	-	35	-

1. Shaft numbers were obtained from CWM during QC sampling; the numbering system has since been changed by CWM.
2. Dry Density, moisture content and void ratio values are values measured in the laboratory at the beginning of each test.
3. Dual shaft numbers designate samples obtained where adjacent shafts overlap.

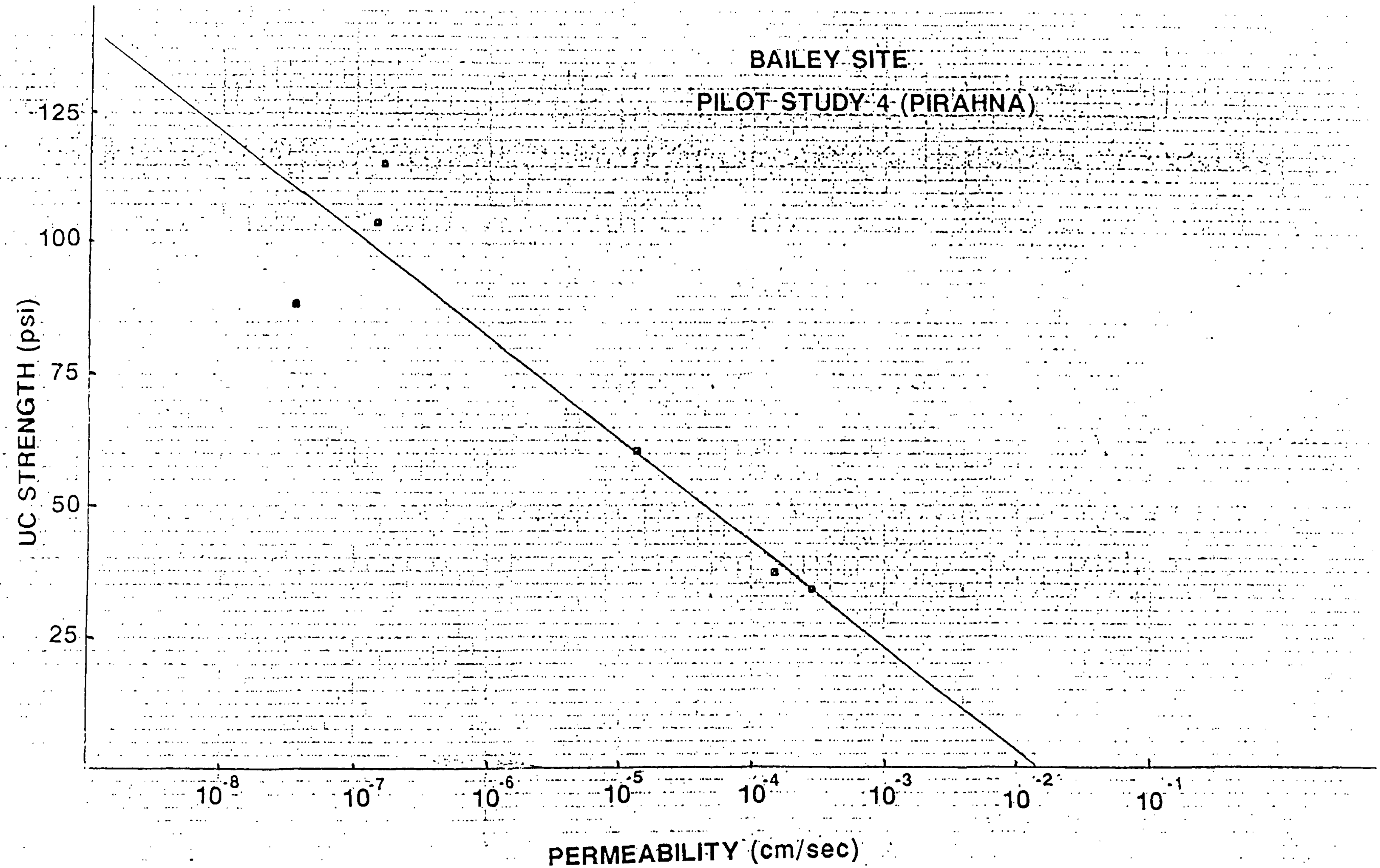


FIGURE 1. UC STRENGTH VS PERMEABILITY

Sheet 1 of 1

DAILY FIELD REPORT

Job No.: 20875 2.4.1

Project: BAILEY PHASE II

Date: 10-15-93

HLA EMPLOYEE: WILLIAM N. THOMPSON

Hours on Site: 10.0

HLA EMPLOYEE:

Hours on Site:

Total Travel Time:

Contractor's Equipment:

ON SITE 6:30

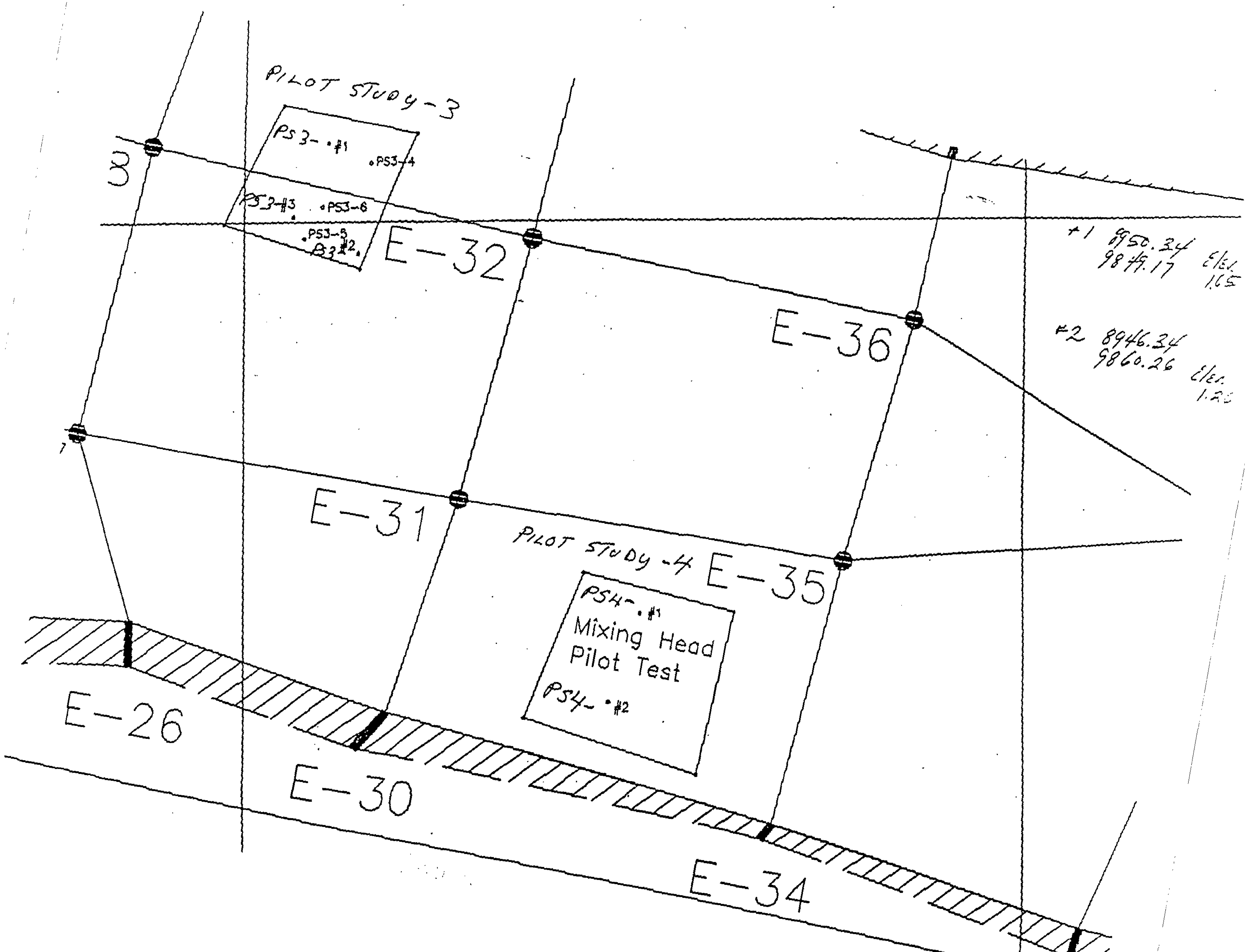
6:30 ON SITE SAFETY MEETING

MILLGARD DRILLED AND STABILIZED 7 SHAFTS IN ACTIVE AREA-I. STABILIZED SHAFT Nos. ARE AS FOLLOWS: 257, 339, 335, 333, 265, 259, AND 256. ALL SHAFTS WERE DRILLED TO COMPLETION DEPTHS. SEE STABILIZATION LOG SHEETS FOR ADDITIONAL INFORMATION.

LAYNE ENVIRONMENTAL SERVICES DRILLED TWO SAMPLE CORE BORINGS IN THE PILOT STUDY-4 AREA. SEE SITE MAP FOR LOCATION OF BORINGS. CORE SAMPLES WERE PACKAGED AND TAKEN TO HLA HOUSTON LAB FOR TESTING.

Attachments: SITE MAP AND STABILIZATION LOG SHEETS

Initial: WNT



PILOT STUDY-3
PS3-#1
PS3-4
PS3-#3
PS3-6
PS3-5
PS3-#2
8
E-32
E-36
E-31
PILOT STUDY-4
E-35
PS4-#1
Mixing Head
Pilot Test
PS4-#2
E-26
E-30
E-34
#1 8950.34
9849.17
Elev.
1.65
#2 8946.34
9860.26
Elev.

10-11-93

Stabilization Equipment for pilot study #4 arrive @ ≈ 9am.

~~Also~~ Discussed stability results with Al. Asked him to call Terra Tech

Chem Waste start stabilizing pilot study #4 @ 12:54pm finished ≈ 2:00pm

20'x20' area used 25 tons of dry agent 51600 ~~tons~~ lbs of dry agent

Called Terra Tech for vibrocoring sampling. No Answer.

General Comments

The piranha appeared to have mixed the waste uniformly; this will be verified during lab testing. The area tested was very soft ~~and~~ (mushy) and had ponded water. This could have helped the mixing process. It is yet to be seen how it will perform in stiff waste. The cement was pumped dry. I do not think the piranha will be effective ~~unless~~ in stiff waste or drier locations unless

10-11-93

the cement is in slurry form.

~~There~~ It is difficult to tell the depth of the stabilization

Bulking was less pronounced than with Milguard; this maybe due to the ponded water and the mushy consistency of the waste.

How can the operator determine the quantity of cement for a given area? There is no measuring guage on the Piranha

FIELD LOG OF BORING

SHEET 1 OF 1

LOCATION OF BORING:

Continuous Sampling

PROJECT: Bailey Superfund	BORING NO. BSA-2
	TOTAL DEPTH: 8
JOB NO.: 20875	LOGGED BY: ACO
PROJ. MGR.: S. Neely	EDITED BY:
DRILLING CONTRACTOR: Layne Environmental	
DRILL RIG TYPE: CME Buggy	
DRILLERS NAME: Roberto Aguilar	
SAMPLING METHODS: Hollow Stem / Core	
HAMMER WT.:	DROP:
STARTED, TIME:	DATE: 10-15-93
COMPLETED, TIME:	DATE: 10-15-93

BORING DEPTH (ft.)	8'		
CASING DEPTH (ft.)			
WATER DEPTH (ft.)			
TIME:			
DATE:			

BACKFILLED, TIME: DATE: BY:

SURFACE ELEV.: DATUM:

CONDITIONS:

SAMPLE DEPTH	SAMPLER TYPE	BLOWS/6-IN.	INCHES DRIVEN	INCHES RECOVERED	SAMPLE CONDITION	DRILLING RATE (min/ft)	DEPTH IN FEET	GRAPHIC LOG	DESCRIPTION
							0–7		Black Stabilized Waste, light weight, uniform color.
							7–8		Olive Gray Silty Sand, wet
							8		BT @ 8'
							9		
							10		

FF7

FIELD LOG OF BORING

SHEET 1 OF 1

LOCATION OF BORING:

Continuous Sampling

PROJECT: Bailey Superfund	BORING NO. PSA-1
	TOTAL DEPTH: 7½'
JOB NO.: 20875	LOGGED BY: ACO
PROJ. MGR.: S. Neely	EDITED BY:
DRILLING CONTRACTOR: Layne Environment	
DRILL RIG TYPE: CME Buggy	
DRILLERS NAME: Roberto Aguilar	
SAMPLING METHODS: Hollow Stem/Core	
HAMMER WT.:	DROP:
STARTED, TIME:	DATE: 10-15-93
COMPLETED, TIME:	DATE: 10-15-93

BORING DEPTH (ft.)	7½'		
CASING DEPTH (ft.)			
WATER DEPTH (ft.)			
TIME:			
DATE:			

BACKFILLED, TIME: DATE: BY:

SURFACE ELEV.: DATUM:

CONDITIONS:

SAMPLE DEPTH	SAMPLER TYPE	BLOWS/6-IN.	INCHES DRIVEN	INCHES RECOVERED	SAMPLE CONDITION	DRILLING RATE (min/ft)				DEPTH IN FEET	GRAPHIC LOG	DESCRIPTION
										1		Black Stabilized Waste, light weight, uniform color
										2		
										3		
										4		
										5		
										6		
										7		Olive Gray Silty Sand, we
										8		BT @ 7½'
										9		
										10		

HARDING LAWSON ASSOCIATES

Sheet 1 of 1

DAILY FIELD REPORT

Job No.: 20875.2.3

Project: Bailey Superfund

Date: 10-15-93

HLA EMPLOYEE:

Hours on Site:

HLA EMPLOYEE: Chris Onuekwusi

Hours on Site: 10

Total Travel Time:

Contractor's Equipment:

Inspected east dike early in the morning. No visible evidence of ~~slope di~~ dike distress.

Drilling crew from Layne Environmental arrive site about 10.15 am and went to safety briefing (45 minutes). They were asked to take an early lunch while Chem Waste prepares access for drill rig. Access was completed at 2.00 pm. Cored Boring # PSA-1 to a depth of 7½ ft and Boring PSA-2 to a depth of 8 ft. Drilling and decontamination of equipment were completed about 5.15 pm.

Core samples were uniform in color - appear to have been well mixed. Samples were sent to HLA Lab in Houston by Bill Thompson

Attachments:

Initial: ACO

HARDING LAWSON ASSOCIATES

Sheet 1 of 1

DAILY FIELD REPORT

Project: Bailey Superfund

Job No.: 20875.2-3

Date: 10-11-93

HLA EMPLOYEE:

HLA EMPLOYEE: Chris Ovrelkman

Hours on Site:

Hours on Site: 10

Total Travel Time:

Contractor's Equipment:

Chem Waste performed pilot Stabilization #A today within a 20'x20' area in Active Area #2. Used a modified trackmounted Gradall with a feed hose and a rotary tiller. Powdered cement/flyash was pumped from a truck through the connecting hose into the waste while the rotary tiller blended mixes the waste. Mixing was relatively uniform (visually) ~~Area stab.~~ Material was soupy and easy to mix. This method appears to be OK if used in waste with the consistency of mashed potatoe. It's performance in stiff waste or clay is yet to be seen. Used about 25 tons of powdered cement.

Inspected the east dike - Water is ponded in some of the sumps along the inside toe of the west dike.

Millgard continued with stabilization. Could not get Terra Technologies to come and sample the waste - nobody was in the office.

Attachments:

Initial: AC

DAILY FIELD REPORT

Job No.: 20875 2.4.1

Project: BAILEY PHASE II

Date: 10-11-93

HLA EMPLOYEE: WILLIAM W THOMPSON

Hours on Site: 10.0

HLA EMPLOYEE:

Hours on Site:

Total Travel Time:

Contractor's Equipment:

ON SITE: 6:30

6:30 SITE SAFTY MEETING

MILLGARD DRILLED AND STABILIZED 12 SHAFTS IN ACTIVE AREA I. STABILIZED SHAFTS NOS. ARE AS FOLLOWS: 164, 169, 170, 172, 171, 206, 175, 168, 204, 176, 199, AND 200. ALL SHAFTS WERE DRILLED TO COMPLETION DEPTHS, SEE STABILIZATION LOG SHEET FOR ADDITIONAL INFORMATION.

STABILIZATION PILOT STUDY No. 4 WAS CONDUCTED IN ACTIVE AREA II. THE STABILIZED AREA WAS 20'X20'. THE EQUIPMENT USED WAS A MODIFIED GRADALL WITH A ROTARY TILLER ATTACHMENT. DRY (BULK) CEMENT UNDER PRESSURE WAS DELIVERED THROUGH THE TILLER ATTACHMENT AS THE WASTE WAS BEING TILLED. THE SECTION BEING WORKED WAS VERY FLUID. THE DRY CEMENT APPEARED TO BLEND UNIFORMLY WITH THE WASTE. IT TOOK 1 HR AND 10 MIN TO INJECT THE DRY CEMENT INTO THE LIQUID WASTE. ANOTHER 30 MIN. MIXING WAS CONTINUED AFTER THE CEMENT, 51600 LBS WAS PLACED. THE TEST AREA HAD NOT COMPLETELY SET UP AS OF THE END OF THE WORKDAY.

Attachments: SITE MAP AND STABILIZATION LOG SHEETS.

Initial: WWT

START FINISH
TIME 12:54 1403

- DEPTH 6.5'
- CEMENT DUST
- STABILIZED AREA VERY FLUID
- 1ST POT 12 MIN 15 MIN

PAYLOAD 51600 LBS
OF CEMENT

STOP 1431